Course Introduction

SWEN-343
Welcome
Goals for the Course

Prepare you for real world
  Be ready to work with diverse systems
  Diverse teams
  Work with teams (intra team)
Create & Maintain Enterprise apps
How is this course different!?
What I Expect

Open & Honest discussions
How do you learn best
   Speak up
We can cover things not on syllabus
Course Resources

Mycourses
  Homeworks
  Project Deliverables
  Put things in the right dropbox
  “Surprise” quizzes

(Tech Blitz and/or team “Research”)
Texbook

Fowler’s PEAA
BUY IT!
Grading

Grading outline is on course website
Reserve right to tweak at any time
Office Hours

Where do I find them?
When should you reach out?
Course Website (one-stop-shop)

http://www.se.rit.edu/~swen-343/
Project Teams

~6 teams
Formed over the weekend
A survey will be made available – follow mycourses link
Enterprise Systems

SWEN-343
Lecture Objectives

• Understand what characterizes a system as an “enterprise system”

• Provide an architectural perspective of an enterprise system
  • Begin to look at typical architectural patterns that address the needs of an enterprise information system
  • Begin to plant design structure concepts and approaches into our thinking

❖ We will revisit and evolve this over the term
What does it mean to be “Enterprise”?

“Enterprise software is an overarching term for any software used in large organizations (whether business or government). It is considered to be an essential part of a computer-based information system, and it provides business-oriented tools such as online payment processing and automated billing systems.”

- Just one definition
Not just a large application with lots of data and code
Can be a small app - 1 class
Not typical
What does it mean to be Enterprise?

➔ Not GUI over DB (GoD)
Complex data, and lots of it

Complex functionality, and lots of it

Business rules and logic that fail all test of logical reasoning

Perceptual integration of legacy and evolution to “next” generation

Applications are important to the business: mission critical
(ilities) Lots of quality requirements: scalability, security, availability, performance, integratability, etc.
What does it mean to be Enterprise?

Examples
Company human resources, investment and cost analysis, credit scoring, insurance processing, supply chain management, customer sales and service, health information systems, cost accounting and reporting, business data analysis, etc.

Non-examples
automobile engine control, word processors, elevator controllers, chemical plant controllers, telephone switches, operating systems, compilers, games, etc.
Characteristics of Enterprise Apps

Hundreds of inter-related classes and data tables with complex flow logic

Persistent data
- Shared between separate applications/modules, often in different companies
- Across program runs
- Often persistent for years
- Highly structured $\leftrightarrow$ Unstructured

Concurrent, distributed access by multiple types of users

Lots of user interaction screens for each type of user

Lots of data in disparate data sources
- Gigabytes is a modest system
- Terabytes/Petabytes is common
Enterprise != Just for business
Enterprise != Large application
Enterprise != “Boring” application

Enterprise = Needs of organization vs. person
Enterprise = Aspect of information system
Design Challenges

Too often, as technologists, we get enamored with the technology (.NET, Java Enterprise Edition, AJAX, Ruby on Rails, Node, Web Services, etc.) and we think that is what makes our applications complex.

We over-engineer and under-engineer our systems. ERP software is no different, but often magnified.

-> No silver bullet, but one of the goals of the course is to address this.
Enterprise Architecture and Integration: Methods, Implementation and Technologies
by Wing Lam and Venky Shankararaman (eds)
IGI Publishing © 2007 (364 pages)
ISBN:9781591408871

Providing case studies that illustrate best practices, this book takes a holistic view of enterprise integration and describes innovative methods, tools, and architectures with which organizations can systematically achieve enterprise integration.

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Enterprise Architecture and Integration—Methods, Implementation, and Technologies

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Section I - Business Requirements and Organizational Modeling

- Chapter I - Dissolving Organisational and Technological Silos—An Overview of Enterprise Integration Concepts
- Chapter II - Success Factors and Performance Indicators for Enterprise Application Integration
- Chapter III - ...and the Social Matters
- Chapter IV - Precontract Challenges—Two Large System Acquisition Experiences

Section II - Business Process Management

- Chapter V - Process Integration Through Hierarchical Decomposition
- Chapter VI - Using a Standards-Based Integration Platform for Improving B2B Transactions
- Chapter VII - The Changing Nature of Business Process Modeling—Implications for Enterprise Systems Integration
- Chapter VIII - Broader Issues—Integration
Other Typical Challenges

Long lasting
  Cannot just re-write everything
  Must live with bad decisions
  How can you predict where you will be in 5 years?
  Death march style projects

Diverse technology
Lots of moving parts
How do these challenges affect
  Your design?
  Development?
  Other areas?....
What we will cover in this class

ERP Architecture
Organization issues
Maintenance
Procurement
Enterprise & the cloud
Devops
Legacy Integration
Quiz - Enterprise or Non-Enterprise?

Sublime (text editor)
Your 261 Django application
Sales management system
Slack

iPhone messaging app
Quiz - Enterprise or Non-Enterprise

Sublime (text editor)
Your 261 Django application
Sales management system - Yes
Slack - Yes

iPhone messaging app - Could be PART of one
Five exabytes of disk storage ship in 2010

Revenues up across the board for all major storage vendors, IDC says

By Lucas Mearian
March 4, 2011 12:45 PM ET

Computerworld - Last year, hard disk drive manufacturers shipped 5,127 petabytes of storage capacity, a 55.7% increase over 2009, according to a report released Friday by market research firm IDC. A petabyte equals 1 million gigabytes, and 1 exabyte equals 1,000 petabytes.

In the fourth quarter of 2010 alone, worldwide external disk storage systems revenues saw year-over-year growth of 16.2%, or just under $6.1 billion, according to IDC's Worldwide Quarterly Disk Storage Systems Tracker.

In the fourth quarter of 2010, the total disk storage systems market grew about $8.3 billion in revenue, representing 14.3% growth year over year.
AN SSD REVOLUTION
“RULER” FORM FACTOR

Intel® Optane™ SSDs and Intel® 3D NAND SSDs in the “ruler” form factor will come to market in the near future.
Worldwide Total Disk Storage Systems Market, Top 5 Vendors
Q1 2014 - Q2 2015 (shares based on Revenue)

Source: IDC Worldwide Quarterly Disk Storage Systems Tracker Q2 2015 (September 2015)
IDC: Worldwide Enterprise Storage Market Sees Decline in 4Q

*Note: Dell Technologies represents the combined revenues for Dell and EMC
*HPE/New H3C Group represents the combined revenues for HPE and New H3C Group
Seagate Q3: 50.8 exabytes shipped  | April 29, 2014 - 20:41 GMT (13:41 PDT) |

Storage player Seagate saw average selling prices jump and that propelled earnings above expectations. Revenue was light in the fiscal third quarter.

Exabytes Shipped and Average Capacity per Drive

Overall, storage shipments were up 8 percent from a year ago to 50.8 exabytes. Wall Street was expecting Seagate to report non-GAAP earnings of $1.25 a share on revenue of $3.42 billion.
2009

COST OF A PETABYTE

RAW DRIVES
- $81,000

BACKBLAZE
- $117,000

DELL
- MD1000: $826,000

SUN
- X4550: $1,000,000

NETAPP
- FAS-6000: $1,714,000

AMAZON®
- AMAZON S3: $2,806,000

EMC
- EMC NS-960: $2,860,000

* Amazon S3 Storage over three years (minus electricity, co-location and administration).
2016

Petarack™

One Petabyte, Expandable to 5.4PB of Raw Data Storage, in a Single Rack Storage Systems That Expand as Your Business Grows.

High Availability SAN $299,000

5 YEAR WARRANTY
PETARACK™
One Petabyte, Expandable to 7.2PB of Raw Data Storage, in a Single Rack
High Availability SAN $299,000
PETARACK™
One Petabyte, Expandable to 8.6PB of Raw Data Storage, in a Single Rack
High Availability SAN $299,000
HP, Dell are winners in disk storage shipped in Q3

December 7, 2014

“IDC said the total worldwide disk storage systems factory revenue grew 5.1% year over year to nearly $8.8bn during the third quarter of 2014. Total disk storage systems capacity shipped was 25 exabytes. New capacity shipments grew 42% year over year during the quarter.” - ITEuropa
Worldwide Enterprise Storage Market Sees Decline in Fourth Quarter

March, 2017

*Flash-Based Storage Systems Highlights*

The total All Flash Array (AFA) market generated almost $1.7 billion in revenue during the quarter, up 61.2% year over year. The Hybrid Flash Array (HFA) segment of the market continues to be a significant part of the overall market with $2.5 billion in revenue and 38.4% market share.
Information Environment

[Chorafas, Enterprise Architecture and New Generation Information Systems]
Islands of Automation or Application Silos

Business Intelligence (BI)

Customer Relationship Management (CRM)

Enterprise Application Integration (EAI)

Supply Chain

Human Resources (HR)
Layering

A core concept of ERP
Be thinking about this as you design your project
How does it affect coupling & cohesion?
What is Layering?

Break apart complicated software systems. Layered almost like a cake/soil strata. Each layer rests on top of another layer.
Layers

Where else have you seen this?

Services provided by lower layers are used by those above.
Why layers?

Why are they important in Software Engineering?
Principle Layers

Presentation
Domain/Business Logic
Data
Layering Drawbacks

Cannot properly encapsulate everything. Could harm performance/complexity. Difficult to decide what layers to have, and what each should be responsible for.
Project

http://www.se.rit.edu/~swen-343/project/projectdeliverables.html
What area/group is missing?
What project questions do you have?
Activity

In self formed teams of 3-5, create a short presentation about “Enterprise Software”
Some points you may focus on include:
  What is it
  What is it not
  What are some examples
Use internet/books.
What separates “Enterprise” from just another large application?